

THAT WHICH IS CLAIMED IS:

1. A method for supplying a clip to a clip window associated with a closure attachment mechanism adapted to allow a single clip or two clips to be controllably applied to a target tubular work piece in a closure zone in an automated manner,
5 comprising:
 - automatically forcing a plurality of clips to travel in a first predetermined clip travel path having a forward direction toward a first punch path in a closure zone at a first point in time;
 - automatically selectively retracting the plurality of clips so that the clips travel
10 in a reverse direction along the first predetermined clip travel path away from the first punch path; and then
 - automatically forcing the plurality of clips to again travel in the forward direction along the first predetermined clip travel path at a second point in time.
- 15 2. A method according to Claim 1, further comprising:
 - automatically holding the plurality of clips above a first clip window associated with the first punch path in the closure zone for a desired interval after said retracting step and before said second forcing step, the interval associated with the number of target tubular workpieces that pass through the closure zone without
20 receiving a clip from the first punch path; and
 - automatically intermittently attaching a clip to selected tubular workpieces that pass through the closure zone using clips advanced along the first clip path to the first punch path during the first and second forcing steps.
- 25 3. A method according to Claim 2, further comprising:
 - repeatedly forcing a second plurality of clips to travel in a second predetermined clip travel path having a forward direction toward a second punch path with a second clip window;
 - automatically concurrently attaching one clip from the first clip punch path
30 and one clip from the second clip punch path thereby selectively applying one clip to a greater number of target tubular workpieces and two clips to fewer numbers of target tubular workpieces as the tubular workpieces move through the closure zone.

4. A method according to Claim 1, wherein the tubular workpieces are stuffed food product held in a casing material, said method further comprising advancing the tubular stuffed food product in a predetermined forward travel path and stalling the forward movement during the forcing steps.

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5. A method according to Claim 4, wherein the stuffed food products are meat products.

6. A method according to Claim 1, further comprising reciprocating a first 10 punch to travel along the first punch path during the first and second forcing steps and the retracting step to selectively direct a clip positioned in the clip window to wrap about an end portion of one tubular product in the first clip window during the first and second forcing steps.

15 7. A method according to Claim 1, wherein the first forcing step comprises pushing the clips to travel in a generally downward direction, and wherein the retracting step comprises pulling the clips to travel in a generally upward direction.

8. A method according to Claim 1, further comprising feeding a spool of 20 attached clips to travel along a generally downwardly extending static rail with a lateral portion that defines the first predetermined travel path so that the forwardmost portion of the spool of clips enters a clip window to engage with a punch attachment mechanism in the first punch path.

25 9. A method according to Claim 8, further comprising punching a clip in the clip window to force the clip to wrap around an underlying target workpiece.

10. A method according to Claim 9, wherein the clips are metallic with a 30 discontinuous perimeter having generally open end portions that when attached to the tubular work product sealably enclose spaced apart end portions of the tubular work product.

11. A method according to Claim 1, wherein the second forcing step comprises contacting an outer perimeter portion of at least one clip with a retraction member having a jaw with first and second opposing spaced apart hinged jaw members in communication with an extension spring configured to allow the hinged 5 jaw members to open and close a desired distance to pull the clips in a generally upward direction away from a clip feed direction.

12. A method according to Claim 11, wherein the first forcing step comprises 10 contacting the outer perimeter of at least one of the plurality of clips with a pivotable pusher pawl and applying force in a generally forward direction to push the plurality of clips in the clip feed direction.

13. A method according to Claim 12, wherein said retracting step comprises: 15 disengaging the pusher pawl from the clips; and engaging the jaw members of the retraction member with a plurality of adjacent clips.

14. A method according to Claim 13, wherein the clip has a central crown region that terminates into two opposing leg portions, and wherein the jaw members 20 have a contact edge portion with a profile that corresponds to the outer profile of the legs of abutting clips.

15. A method according to Claim 13, wherein said first and second forcing steps comprise: 25 disengaging the jaw members of the retraction member from the clips; and engaging the pusher pawl with the clips.

16. A method according to Claim 12, wherein the pusher pawl is disposed above the retraction member.

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17. A method according to Claim 16, further comprising separating the retraction jaws a suitable distance to release the clips after the retracting step and before the second forcing step.

18. A method according to Claim 17, wherein the opposing jaw members have legs with opposing top and bottom end portions, the top end portions being pivotably connected to the retraction mechanism and the bottom end portions defining the clip contact portion with the extension spring laterally extending therebetween.

19. A method according to Claim 18, wherein the retraction member further comprises at least one jaw stop disposed above the retraction jaw members, the retraction jaw members each having an inner surface that faces the other, wherein, in operation, the jaw stop defines a cam surface and the jaw retraction member inner surfaces cooperate with the jaw stop cam surface to force the spaced apart legs to open and stretch the spring extending therebetween.

20. A method according to Claim 15, wherein the pusher pawl is disposed above the retraction member, said method further comprising rotating the pusher pawl upon contact with a stop anvil disposed above the pusher pawl to space the head away from the clips to thereby disengage the pusher pawl from the clips.

21. A method for controllably supplying a clip to a clip window associated with a closure attachment mechanism having a closure delivery path for allowing attachment of a single clip or two clips concurrently to a target tubular work piece in a closure zone, comprising:

25 automatically pushing a plurality of clips to travel in a first predetermined clip travel path having a forward direction toward a first closure delivery path in a closure zone at a first point in time;

automatically selectively pulling the plurality of clips so that the clips travel in a reverse direction along the first predetermined clip travel path; and then

automatically pushing the plurality of clips to again travel in the forward direction along the first predetermined clip travel path at a second point in time.

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22. An apparatus for supplying a clip to a clip window associated with a closure attachment mechanism having a closure delivery path for attaching a single clip or two clips to a target tubular work piece in a closure zone, comprising:

means for forcing a plurality of clips to travel in a first predetermined clip travel path having a forward direction toward a first closure delivery path in a closure zone at a first point in time;

5 means for selectively retracting the plurality of clips so that the clips travel in a reverse direction along the first predetermined clip travel path; and then means for forcing the plurality of clips to again travel in the forward direction along the first predetermined clip travel path at a second point in time.

10 23. An apparatus according to Claim 22, further comprising means for holding the plurality of clips above a first clip window associated with the first closure delivery path in the closure zone for a desired interval, the interval associated with the number of target tubular workpieces that pass through the closure zone without receiving a clip from the first closure delivery path.

15 24. An apparatus according to Claim 23, further comprising means for repeatedly forcing a second plurality of clips to travel in a second predetermined travel path having a forward direction toward a second closure delivery path with a second clip window at the first and second points in time and while the means for retracting and holding are applied to the first plurality of clips;

20 means for concurrently attaching one clip from the first clip closure delivery path and one clip from the second clip closure delivery path during the first and second points in time; and

25 means for selectively applying one clip to a greater number of target tubular workpieces and two clips to fewer numbers of target tubular workpieces as the tubular workpieces move through the closure zone.

30 25. An apparatus according to Claim 22, wherein the tubular workpieces are stuffed food product held in a casing material, said apparatus further comprising means for advancing the tubular stuffed food product in a predetermined forward travel path and stalling the forward movement while the clips are applied by the means for forcing.

26. An apparatus according to Claim 25, wherein the stuffed food products are meat products or cheese products.

27. An apparatus according to Claim 22, wherein the means for retracting 5 comprises means for pulling the clips in a generally upward direction by contacting an outer perimeter portion of at least one clip with a retraction member having a jaw with first and second opposing spaced apart hinged jaw members in communication with an extension spring configured to allow the hinged jaw members to open and close a desired distance.

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28. An apparatus according to Claim 27, wherein the means for forcing comprises pushing the plurality of clips in the forward direction by contacting the outer perimeter of at least one of the plurality of clips with a pivotable pusher pawl and applying force in the generally forward direction.

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29. A system for attaching closure clips to elongate or tubular products held in casing materials, comprising:

a curvilinear clip rail having opposing top and bottom end portions and defining a generally downwardly extending clip feed direction;

20 a clip entry window in communication with the bottom end portion of the clip rail and a clip closure delivery path in communication with an attachment mechanism that is adapted to wrap a clip about a target tubular work piece;

a clip pusher configured to selectively engage with clips held on the clip rail to force the clips in the feed direction; and

25 a clip retraction assembly configured to selectively engage with clips held on the clip rail to force the clips away from the clip window and away from the clip feed direction.

30. A system according to Claim 29, further comprising:

30 a first actuation cylinder in communication with the clip pusher;

a second actuation cylinder in communication with the clip retraction member;

and

a control module configured to direct the actuation of the first and second cylinders to selectively feed or not feed a clip through the clip window.

31. A system according to Claim 30, further comprising a frame member
5 configured to cooperate with the first actuation member and to hold the clip pusher, and a pusher stop member disposed above the clip pusher, wherein the clip pusher is pivotably mounted to the frame member and, wherein, in operation, when the first actuation cylinder travels to an extended state, the clip pusher engages at least one clip to force the clips in the feed direction and when the first actuation cylinder is in a
10 retracted state, the pusher stop member pivots the clip pusher away from the clip rail to disengage from the clips.

32. A system according to Claim 30, further comprising a mounting member that holds the retraction assembly and is in communication with the second actuation cylinder, the retraction assembly having a retraction jaw with cooperating spaced apart first and second legs, each leg having opposing top and bottom portions, the leg top portions being pivotably attached to the mounting member, the retraction jaw further comprising an extension spring extending between the first and legs, wherein, in operation, when the second actuation cylinder is in an extended state, the retraction assembly is configured with the jaw legs spaced apart sufficiently to not contact the clips on the clip rail, and when the second actuation cylinder travels to a retracted state, the legs of the retraction assembly jaw close a distance to engage opposing sides of at least one clip and move the clips on the clip rail upward so that the clip window is devoid of a clip therein.

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33. A system according to Claim 29, wherein the attachment mechanism comprises a punch, which, in operation, operates substantially continuously during production of a chain of a plurality of linked, encased tubular product.

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34. A computer program product for operating a shirred casing voiding/clipping apparatus having two proximate clip attachment mechanisms with first and second clip travel paths to selectively deliver one clip or two clips concurrently to a chain of chub product, the computer program product comprising:

a computer readable storage medium having computer readable program code embodied in said medium, said computer-readable program code comprising:

computer readable program code that controllably actuates a first actuation cylinder to push clips in a first clip feed direction; and

5 computer readable program code that controllably actuates a second actuation cylinder to pull clips away from the clip feed direction.

10 35. A computer program product according to Claim 34, further comprising computer readable program code that allows a user to select a desired number of links of chubs and/or a desired chain length of linked chubs.

15 36. A computer program product according to Claim 35, further comprising computer readable program code that directs the first and second actuation cylinders to apply the appropriate number of single and dual clips at the appropriate links in the chain based on the user input.